Objetivos do Trabalho

Introdução e Motivação

Apresentação do Bruno

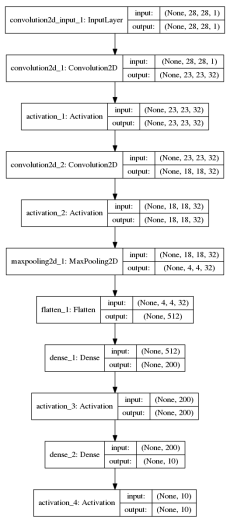
Apresentação do Bruno Canale

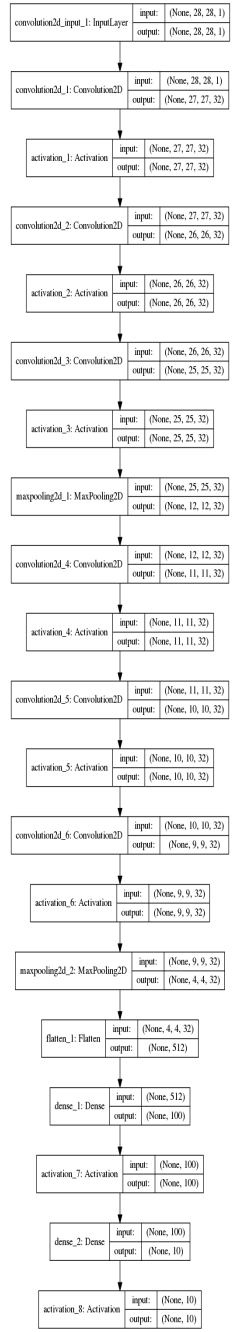
Python - Keras Framework para Machine Learning

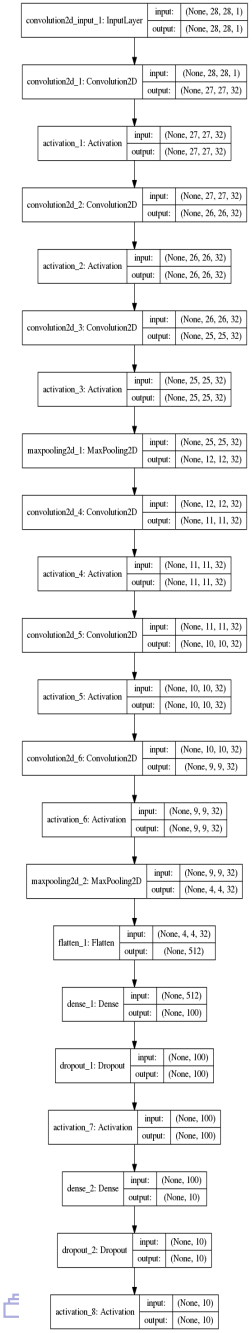
Base de dados utilizada

Implementação da Rede Convolucional

Redes e Resultados

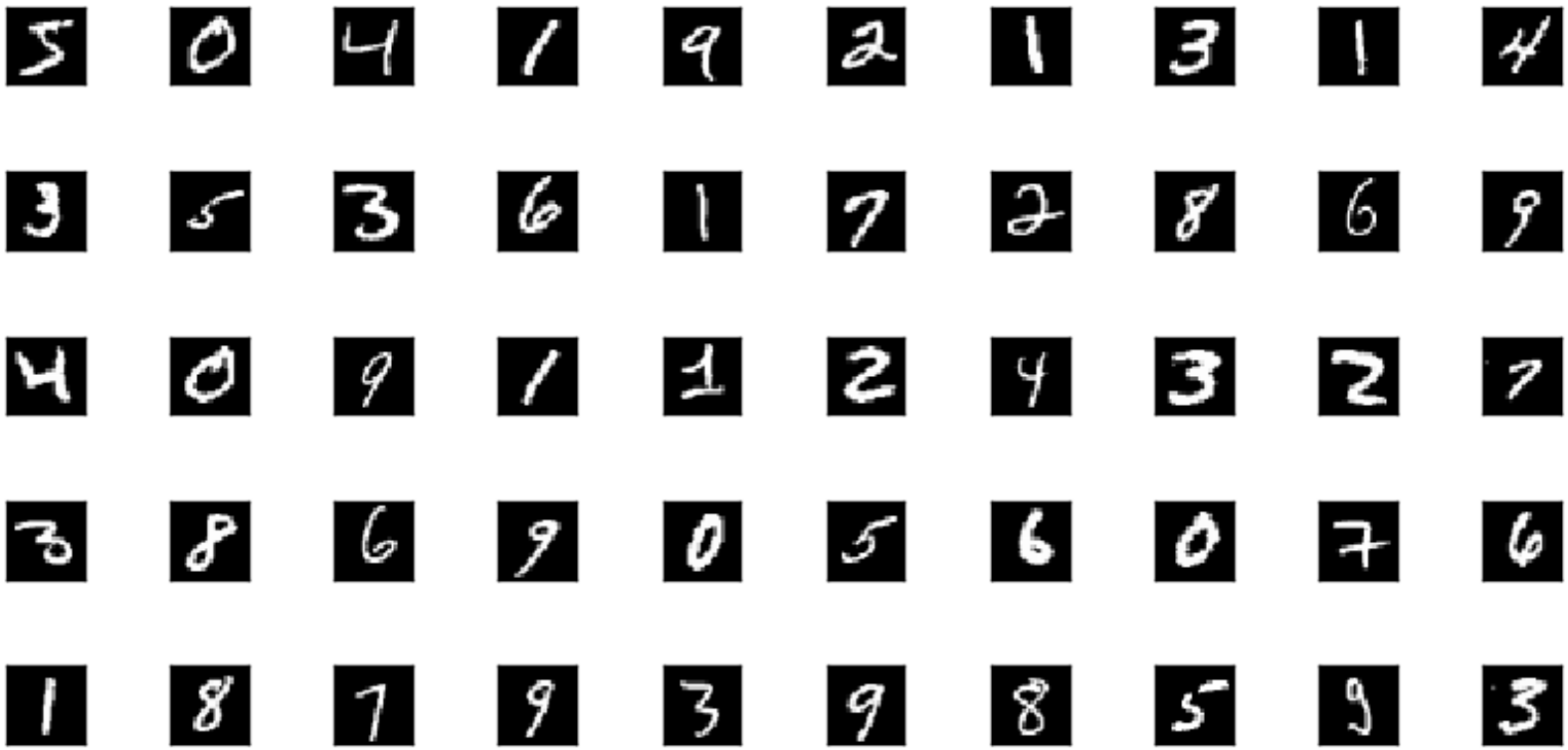




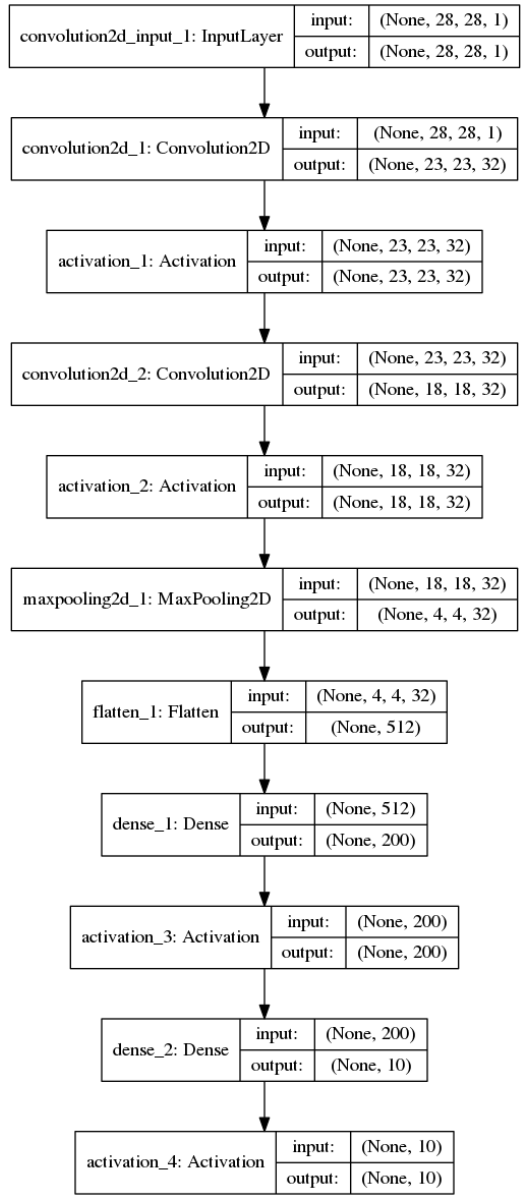


Camada de entrada

MNIST DATASET



Aplicação da CNN



Treinamento

Treinamento

- Épocas = 10
- Itens = 60000
- Tempo = 30 40 minutos

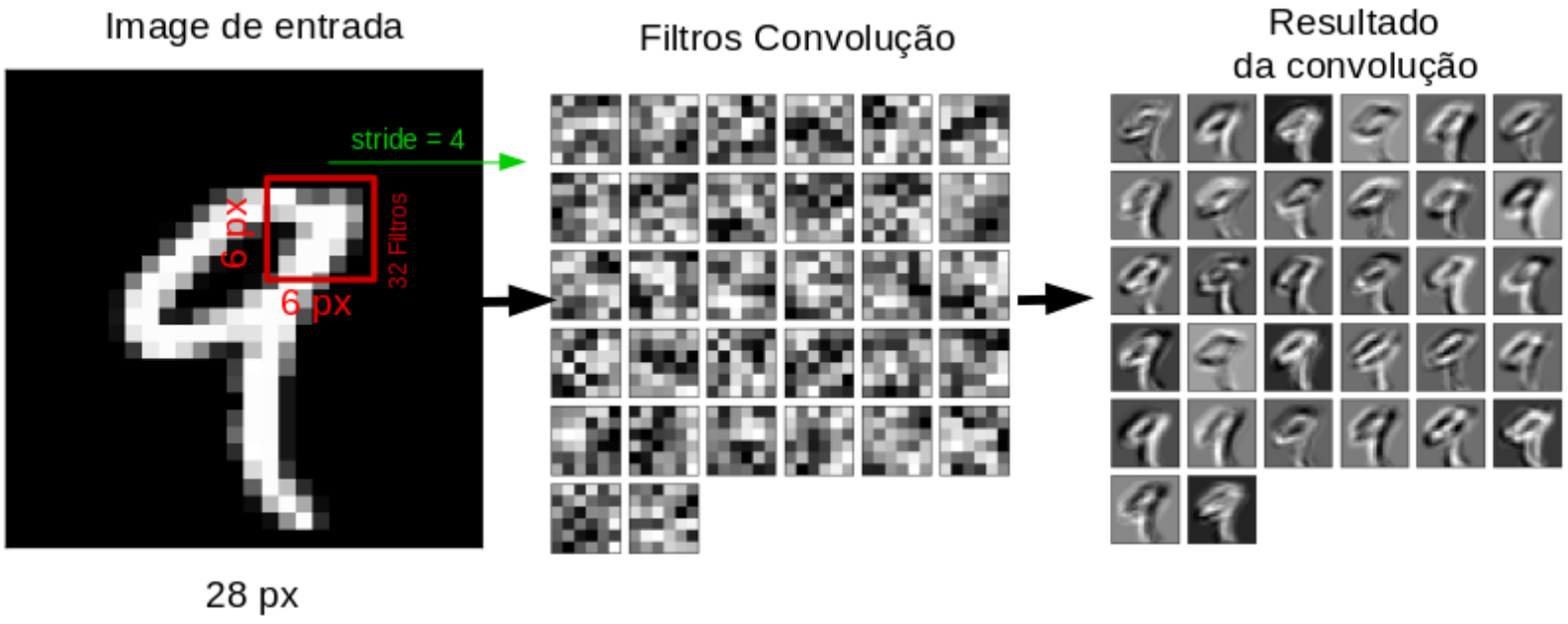
Teste

- Itens = 10000

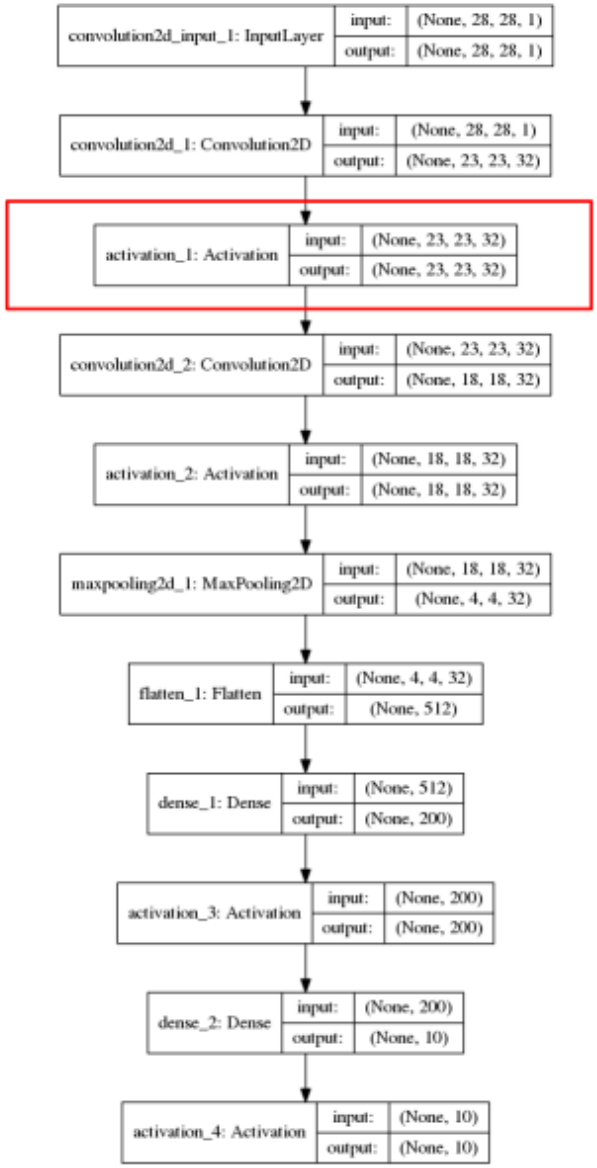
Resultado na base de teste

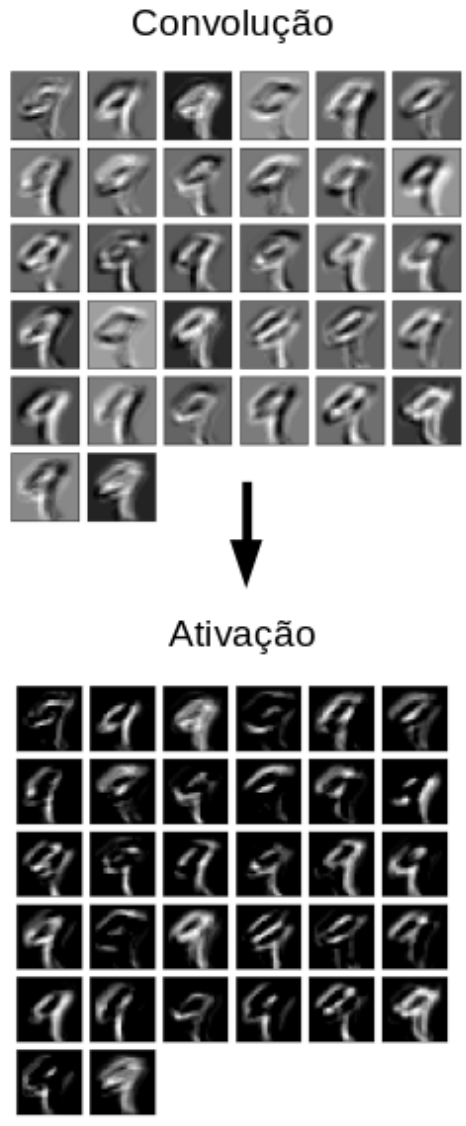
- 98.02%

Convolução - 1

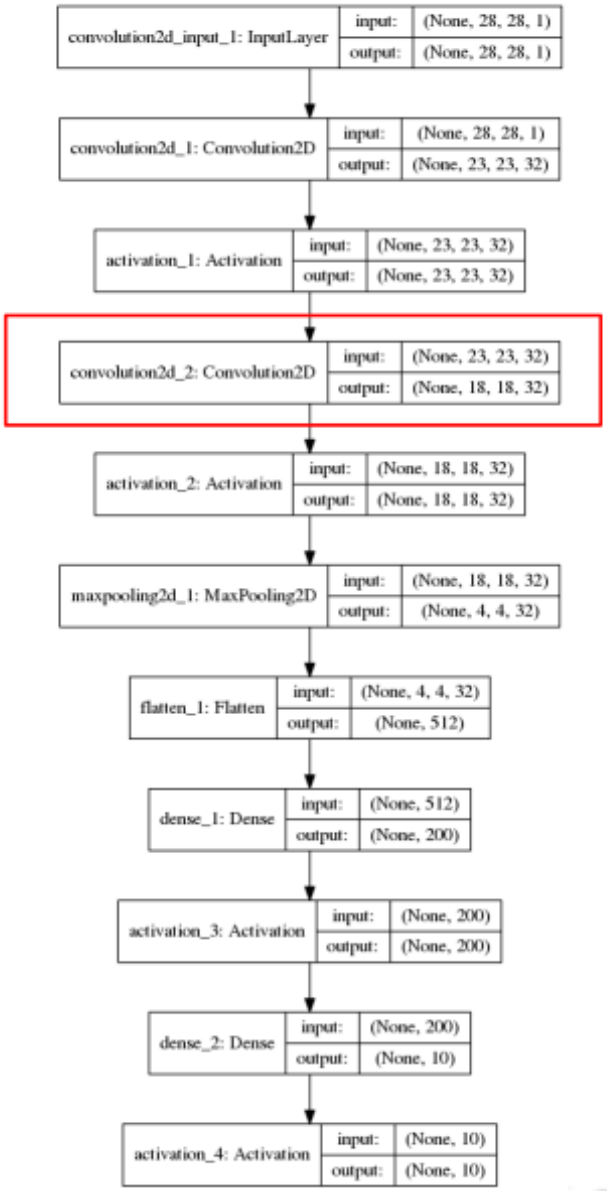


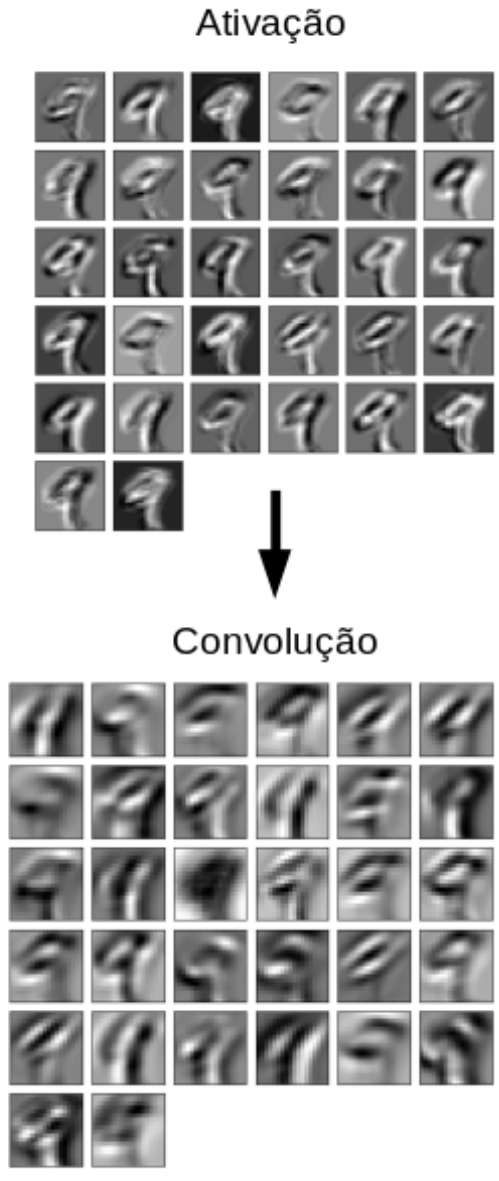
Ativação - 1

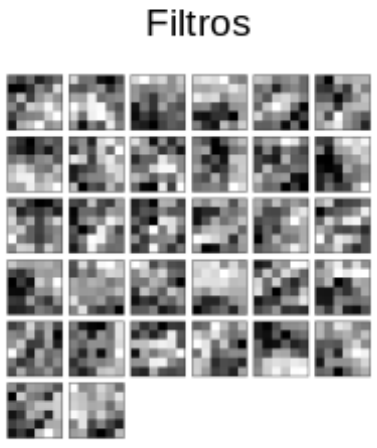

convolution2d_input_1: InputLayer
input: (None, 28, 28, 1)
output: (None, 28, 28, 1)
convolution2d_1: Convolution2D
input: (None, 28, 28, 1)
output: (None, 23, 23, 32)
activation_1: Activation
input: (None, 23, 23, 32)
output: (None, 23, 23, 32)
convolution2d_2: Convolution2D
input: (None, 23, 23, 32)
output: (None, 18, 18, 32)
activation_2: Activation
input: (None, 18, 18, 32)
output: (None, 18, 18, 32)
maxpooling2d_1: MaxPooling2D
input: (None, 18, 18, 32)
output: (None, 4, 4, 32)
flatten_1: Flatten
input: (None, 4, 4, 32)
output: (None, 512)
dense_1: Dense
input: (None, 512)
output: (None, 200)
activation_3: Activation
input: (None, 200)
output: (None, 200)
dense_2: Dense
input: (None, 200)
output: (None, 10)
activation_4: Activation
input: (None, 10)
output: (None, 10)


Convolução
Ativação

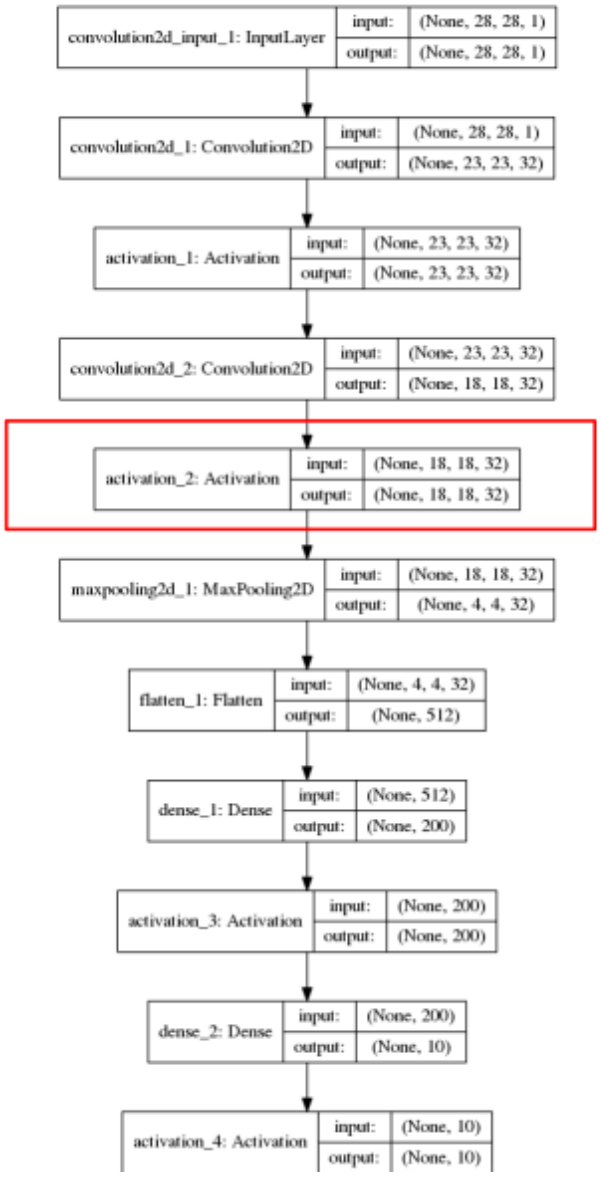
Convolução - 2







Ativação - 2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activation_1: Activation
input: (None, 23, 23, 32)
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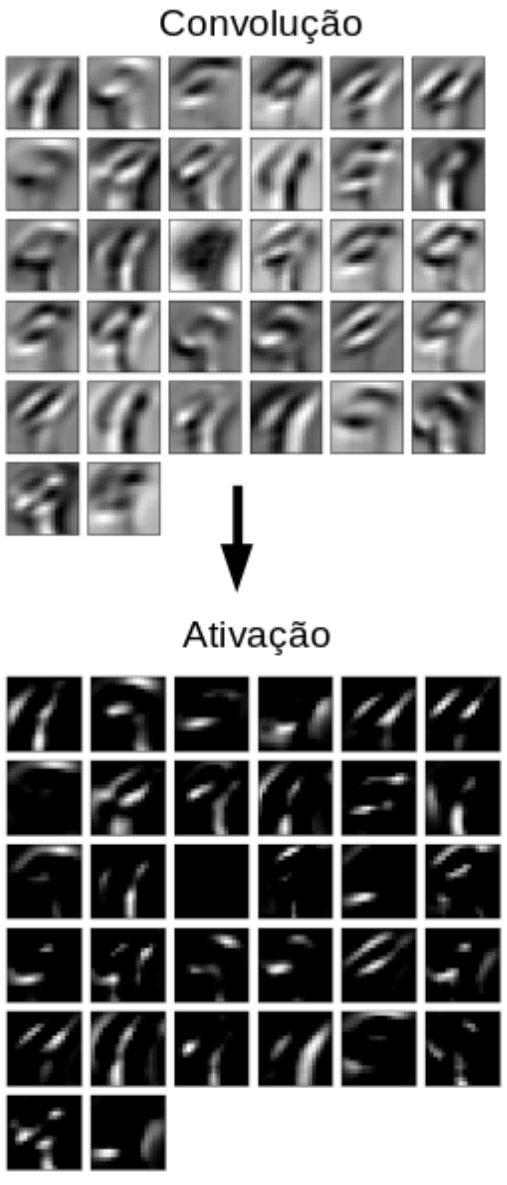
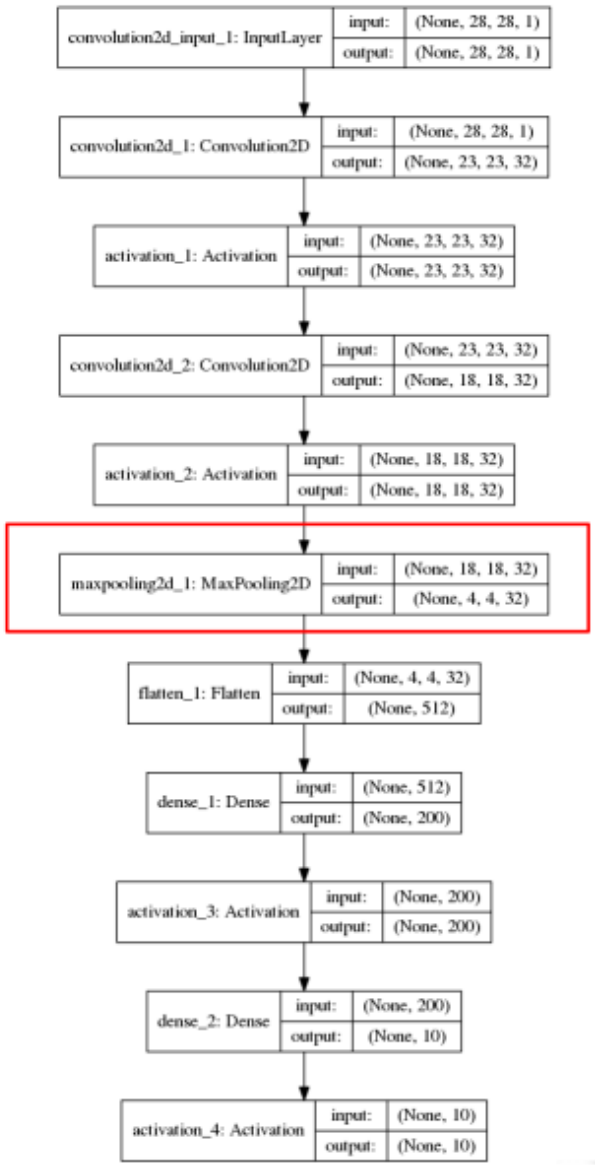
convolution2d_2: Convolution2D
input: (None, 23, 23, 32)
output: (None, 18, 18, 32)
activation_2: Activation
input: (None, 18, 18, 32)
output: (None, 18, 18, 32)
maxpooling2d_1: MaxPooling2D
input: (None, 18, 18, 32)
output: (None, 4, 4, 32)
flatten_1: Flatten
input: (None, 4, 4, 32)
output: (None, 512)
dense_1: Dense
input: (None, 512)
output: (None, 200)
activation_3: Activation
input: (None, 200)
output: (None, 200)
dense_2: Dense
input: (None, 200)
output: (None, 10)
activation_4: Activation
input: (None, 10)
output: (None, 10)


Convolução
Ativação

Pooling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dense_2: Dense
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output: (None, 10)
activation_4: Activation
input: (None, 10)
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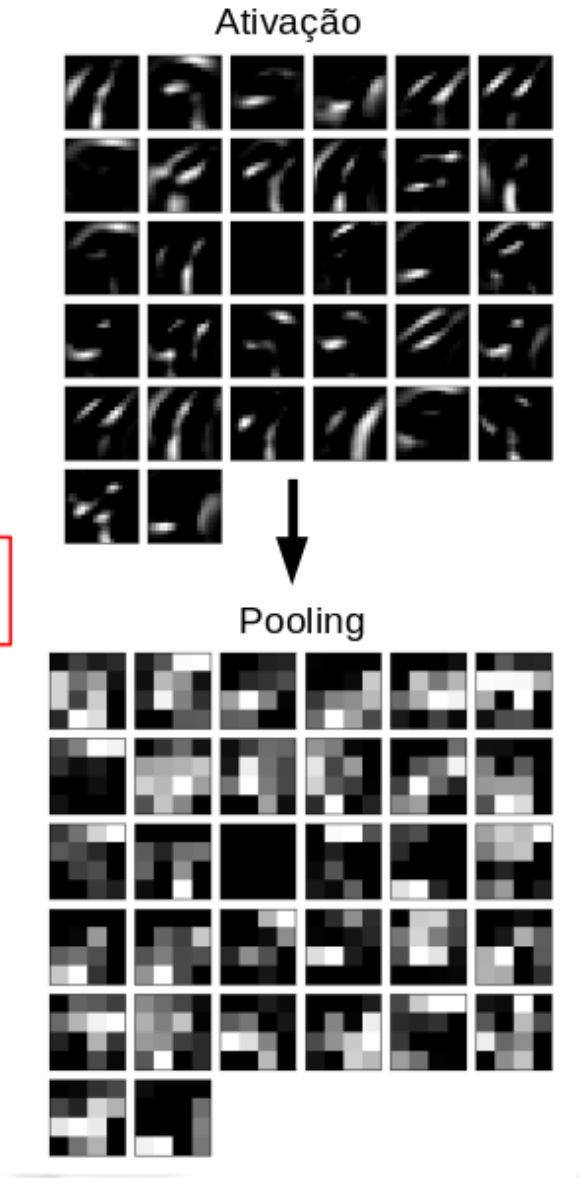
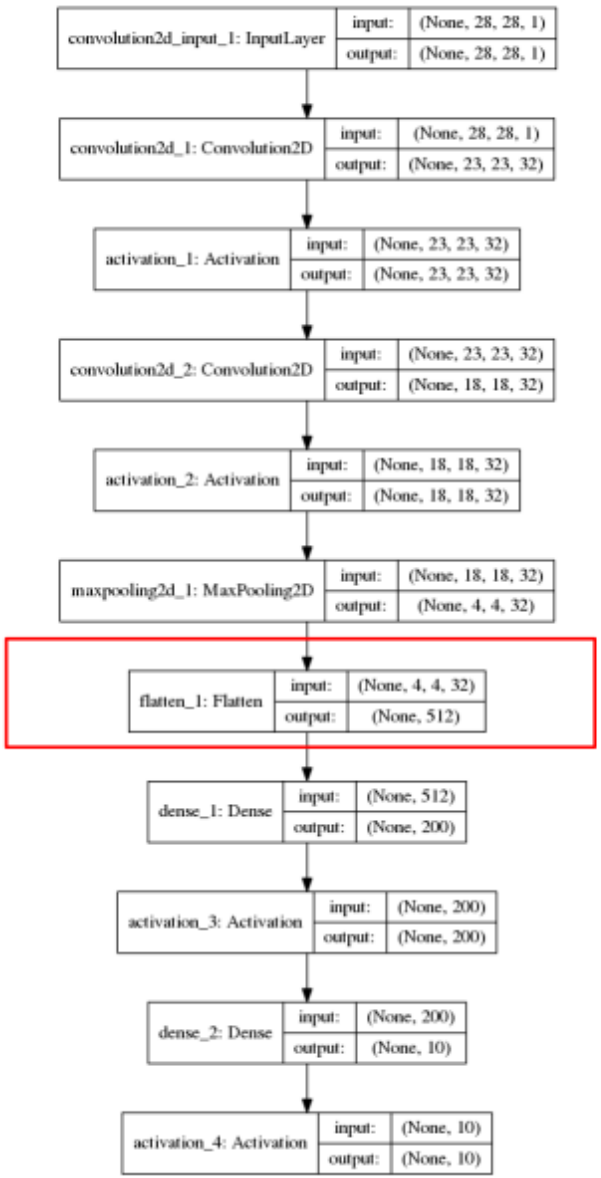
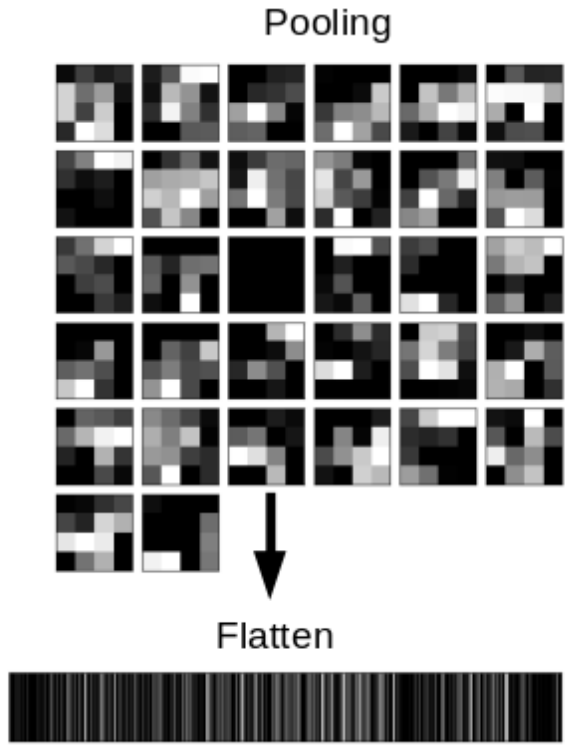
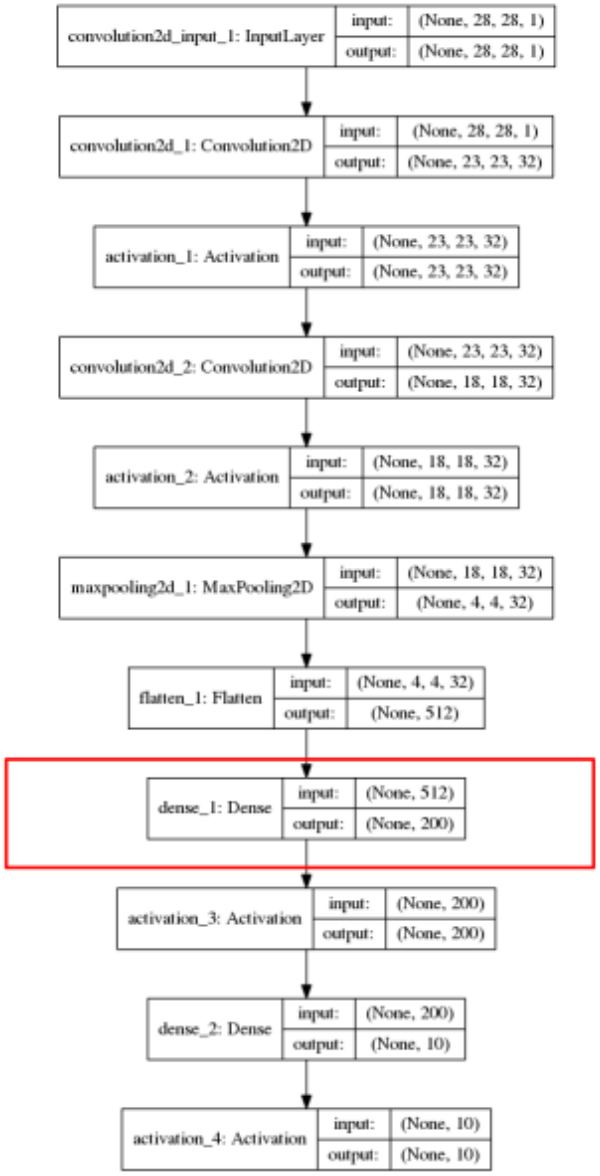

Ativação
Pooling

Flatten (N * 2D -> 1D)





Dense - 1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output: (None, 18, 18, 32)
maxpooling2d_1: MaxPooling2D
input: (None, 18, 18, 32)
output: (None, 4, 4, 32)
flatten_1: Flatten
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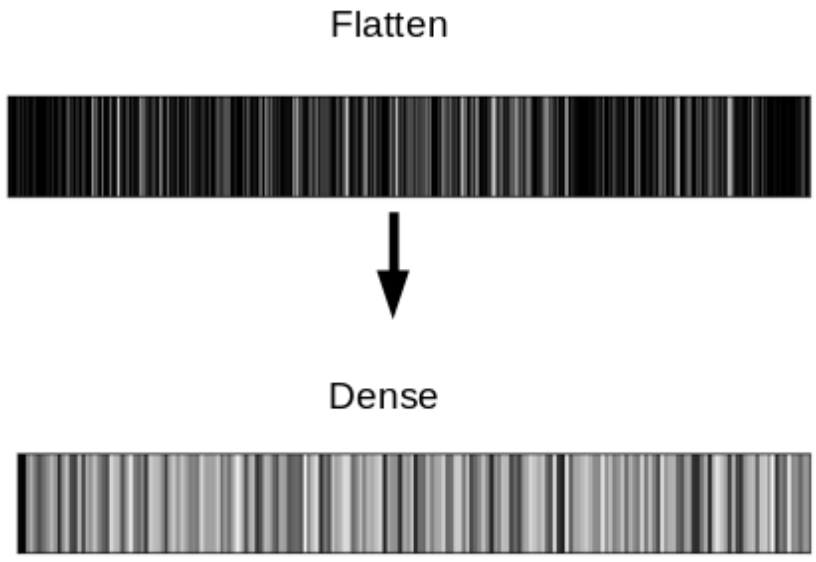
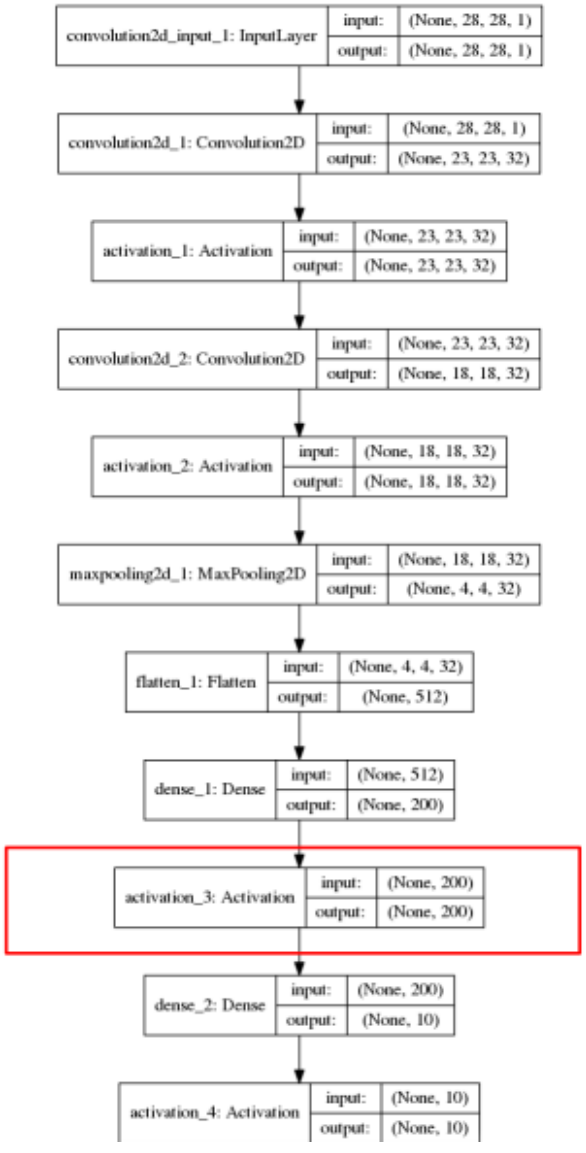
input: (None, 200)
output: (None, 200)
dense_2: Dense
input: (None, 200)
output: (None, 10)
activation_4: Activation
input: (None, 10)
output: (None, 10)


Flatten
Dense

Ativação - 3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activation_3: Activation
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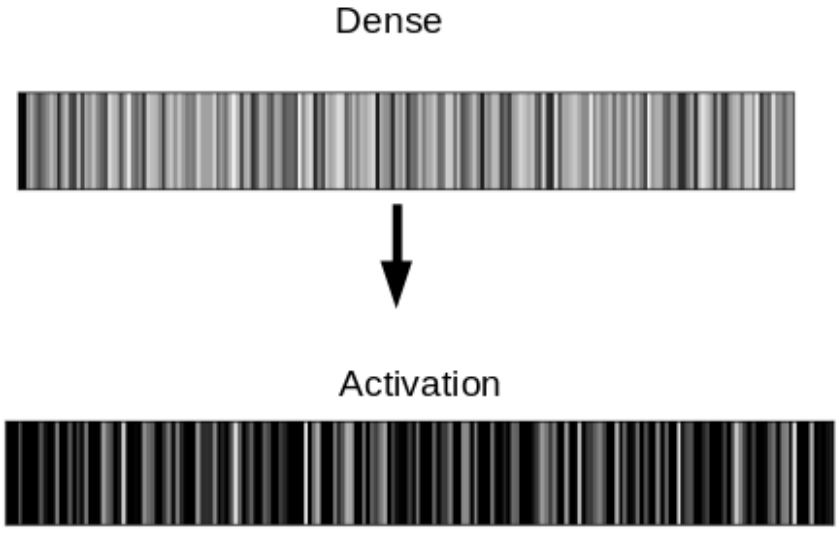
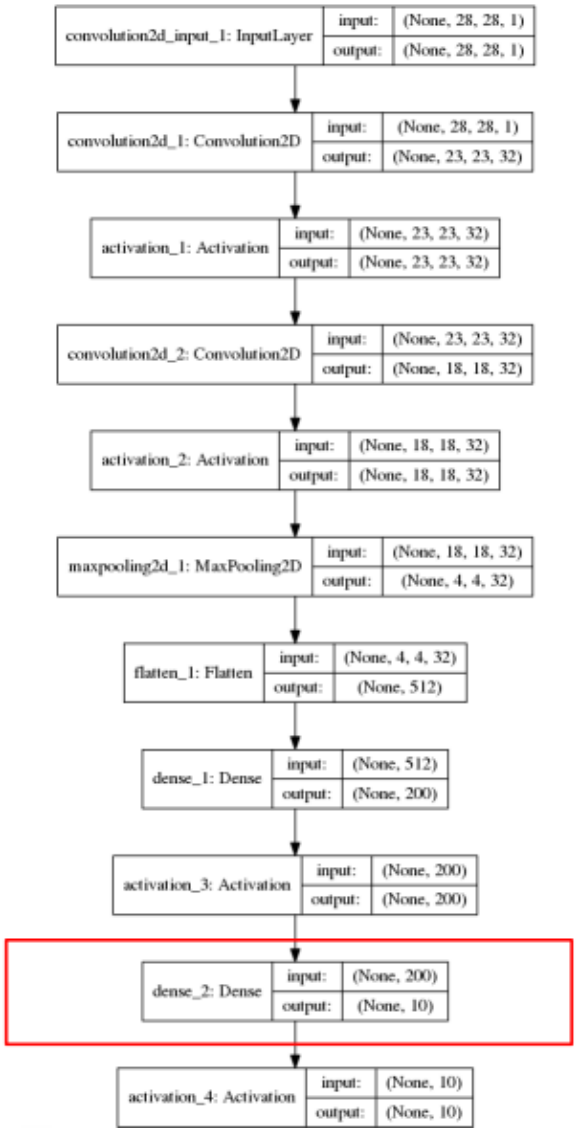
output: (None, 10)
activation_4: Activation
input: (None, 10)
output: (None, 10)


Dense
Activation

Dense - 2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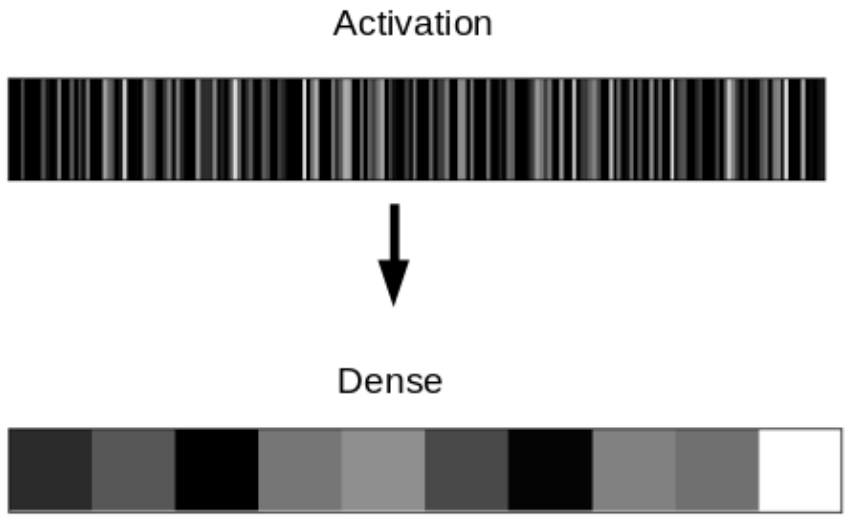
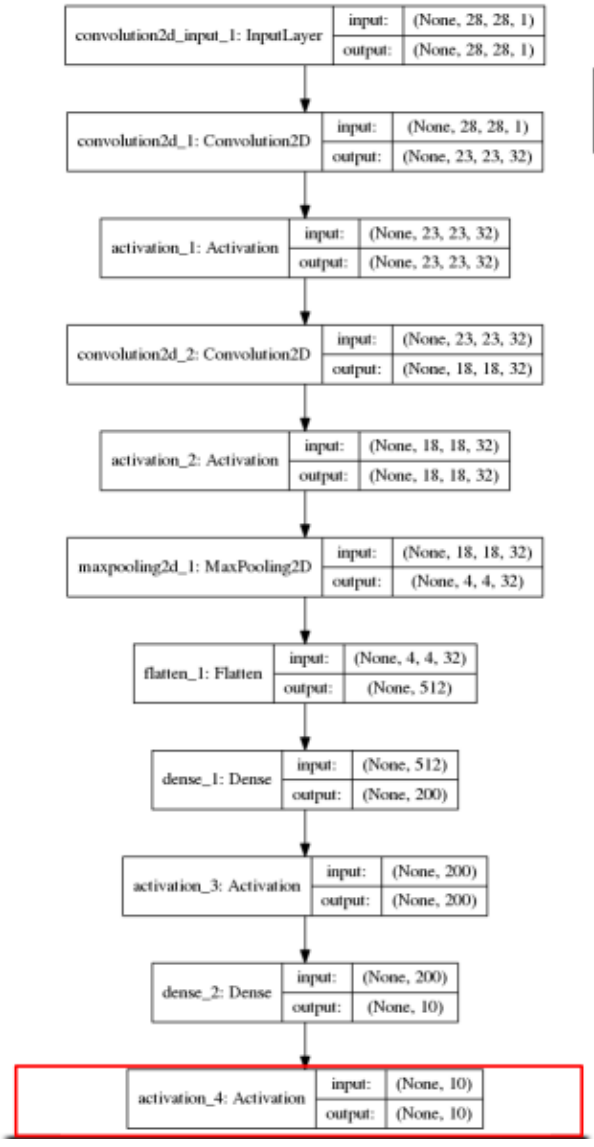

Activation
Dense

Ativação - 4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activation_3: Activation
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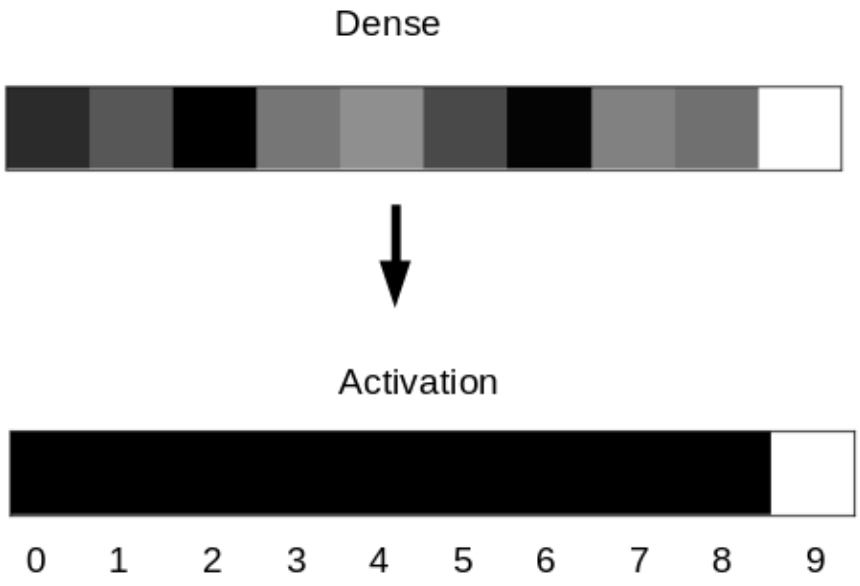
output: (None, 200)
dense_2: Dense
input: (None, 200)
output: (None, 10)
activation_4: Activation
input: (None, 10)
output: (None, 10)

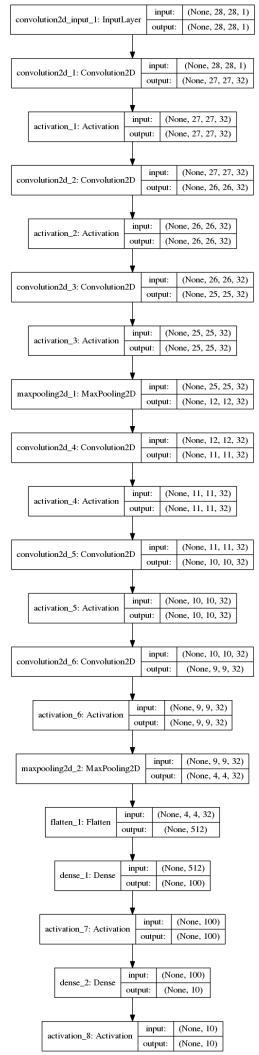

Dense
Activation
0 1 2 3 4 5 6 7 8 9

Resultados das demais redes testadas - 1

Precisão na base de treino: 98.94%

Precisão na base de teste: 98.89%

3 conv + 1 pooling + 3 conv + 1 pooling + 2 FC

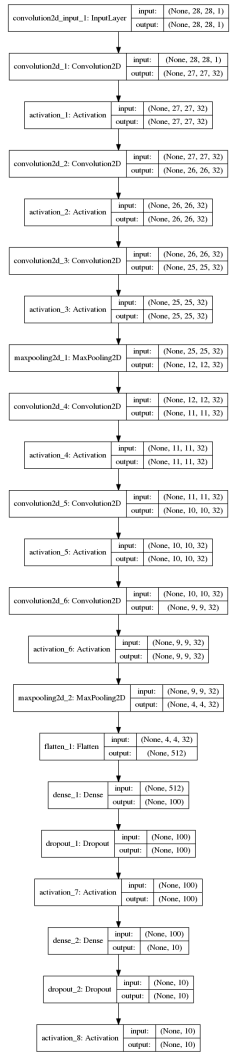


Resultados das demais redes testadas - 2

Precisão na base de treino: 98.94%

Precisão na base de teste: 99.06%

3 conv + 1 pooling + 3 conv + 1 pooling + 2 FC *comdropout*



MLP & CNN

- CNN é uma extensão do conceito da MLP
- Convoluções e Pooling ajudam a diminuir rapidamente o número de variáveis do sistema
- Próprio para o processamento de imagens e vídeos